Notes about the web site: All photos and videos included in the web site have already been approved for public release – they were taken from the NASA image exchange (http://nix.nasa.gov/nix.cgi) and the propulsion section of SSC's public web site (http://www.ssc.nasa.gov/propulsion/). To save space, these have not been included in this document.

About IPDS

Mission

The Integrated Propulsion Data System's (IPDS) focus is to provide technologically-advanced philosophies of doing business at SSC that will enhance the existing operations, engineering and management strategies and provide insight and metrics to assess their daily impacts, especially as related to the Propulsion Test Directorate testing scenarios for the 21st Century.

What we do

The Integrated Propulsion Data System (IPDS) represents a mixture of various technologically-advanced philosophies that have been integrated to help the John C. Stennis Space Center (SSC) assess its day-to-day testing responsibilities, assist in improving the quality of work processes, and develop products to aid in the overall functioning of various directorates within SSC. These philosophies are implemented via state-of-the-art software and hardware that will provide the following capabilities:

- Accurate and precise cost estimation
- Decision support
- Planning and scheduling
- Data warehousing
- Project and requirements management
- Process improvement
- Risk and impact assessment

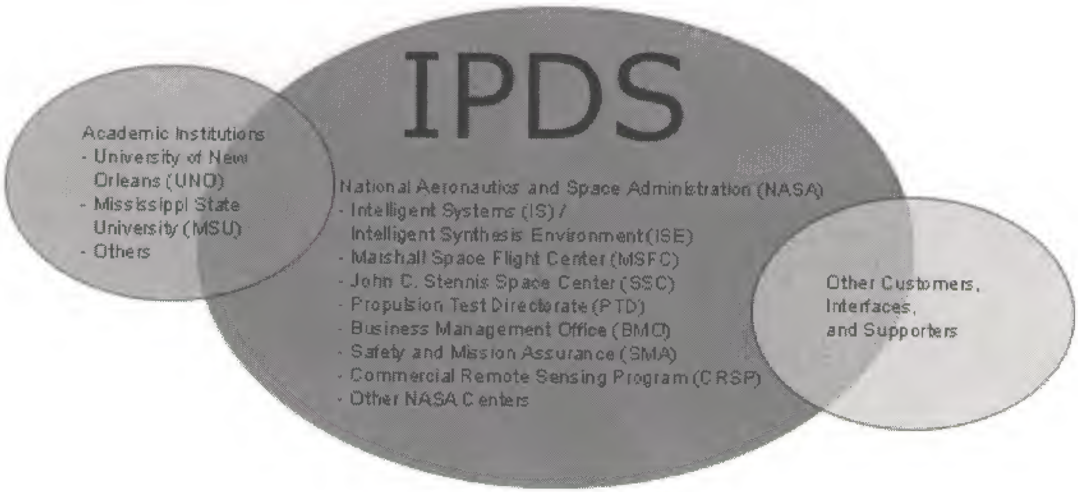
Who we are

The IPDS team is composed of Stennis Space Center (SSC) experts, all dedicated to applying these technologically advanced philosophies to all IPDS tasks. The team is well rounded with a skill-mix from various professional backgrounds. These include mechanical, electrical and industrial engineering; hardware and software engineering; mathematics and statistics; and business and marketing. Most of the team members have been part of SSC for 5 or more years, and several have been with SSC for 10 to 20 years or more.

The team, therefore, has an adequate blend of tenure and is very familiar with how SSC performs its day-to-day business activities. This experience base helps them to

not only adequately assess the needs of Propulsion Test Directorate projects, but also affords them opportunities to know key contact individuals, within and throughout the various agencies, in addressing problems and finding solutions.

Organizational Chart



How to Work With Us

Overview

There are two ways to work with Stennis Space Center's Rocket Propulsion Testing Program:

Test your own test article

(Based on publicly available information located at: http://www.wstf.nasa.gov/Business/Buying.htm)

Assistance to industry and non-NASA government customers is furnished on a cost-reimbursable basis. Stennis Space Center (SSC) is able to provide a service that benefits both our customers and us. With your business, we are able to maintain our skilled staff and increase our test capability and knowledge. The customer who does business with SSC gets the benefit of our state-of-the-art technology and expertise at a fraction of the cost of what it would take to generate the data themselves.

To get started, fill out our application form so that we can learn about your general testing requirements.

NASA Request for Assistance (NRA)

(Based on publicly available information located at:
http://www.hq.nasa.gov/office/procurement/nraguidebook/gdbkintr.html)

NASA funds thousands of proposals each year to study the natural phenomena of the Earth and the cosmos, life sciences, materials sciences, and advanced technologies that have application for aeronautic and space transportation systems. NASA solicits these proposals through a variety of announcements, including the Announcement of Opportunity (AO), the NASA Research Announcement (NRA), and the Cooperative Agreement Notice (CAN). Awards through these various solicitations fund thousands of scientists, engineers, and educators each year at U.S. nonprofit and commercial organizations, as well as Federal research institutions including NASA's field Centers.

NASA's Office of Aerospace Technology (OAT) Research Opportunities page provides information about current and future aerospace research opportunities with NASA. CBDNet is updated daily with the latest government procurement and contract award announcements. To obtain detailed information and contacts for a particular NRA, visit the Procurement site. The NRA Proposer's Handbook is a definitive, up-to-date handbook about responding to an NRA.

Further material about all of NASA's many interests and programs may be found through links starting at the NASA homepage at http://www.nasa.gov/ .

Steps Involved

If you plan to provide your own test article:

- To get started with the testing process, fill out the online form to tell us about your requirements.
- An SSC representative will contact you shortly thereafter for further discussion about whether SSC provides the proper infrastructure for your testing requirements.

If SSC is a good match, then the following steps take place:

- We'll give you an account to access test planning information online.
- A Space Act Agreement is developed, which allows you to do business with NASA. Typical Time Required: 3 to 6 months.
- You and SSC plan a program schedule based on time requirements and availability of the test stands. Typical Time Required: 1 week
- Funding authorization is obtained. Typical Time Required: 1 week to 6 months

After the above steps have been completed, internal preparation for testing begins.

If you plan to respond to an NRA:

The NASA Proposer's Guidebook contains details about preparing a response to an NRA and an overview of the process.

Testing at SSC

Overview

(Based on publicly available information at http://www.ssc.nasa.gov/~pais/factsheets/html/fs-ssc-propulsion.html)

The John C. Stennis Space Center is located in Southern Mississippi near the Mississippi Louisiana state line. SSC is chartered as the National Aeronautics and Space Administration (NASA) Center of Excellence for large space transportation propulsion system testing. This charter has led to many unique test facilities, capabilities, and advanced technologies through the supporting infrastructure.

SSC has conducted projects in support of such diverse activities such as liquid and hybrid rocket testing and development, material development, non-intrusive plume diagnostics, plume tracking, commercial remote sensing, test technology, and more. On May 30, 1996 NASA designated Stennis the lead center for rocket propulsion testing, giving the center total responsibility for conducting and/or managing all NASA rocket engine testing. Test services are now available not only for NASA but also for the Department of Defense, other government agencies, academia, and industry.

History

(Based on publicly available information at: http://www.ssc.nasa.gov/about/history/)

Creation of Stennis Space Center

In October 1961, an historic announcement was made: the federal government had selected an area in Hancock County, Mississippi to be the site of a static test facility for launch vehicles to be used in the Apollo manned lunar landing program. This location offered ample land for construction of large test facilities with water access for shipping rocket stages and barge loads of propellants. In addition, the site was nearly uninhabited, which provided the separation from surrounding communities that is required for test operations.

This location came to be known as the Stennis Space Center (SSC). Today, a 13,500-acre fee area contains the facility infrastructure and test facilities for conducting large rocket tests. A 125,327-acre buffer zone, surrounding the fee area, provides and acoustical buffer and a barrier to community encroachment.

Saturn V testing for Apollo mission

The first assignment at SSC was to certify all first and second stages of the Saturn V Rocket for the Apollo program. The program began with the first static firing on April 23, 1966, and continued into the early 1970s.

As part of this program, SSC tested and proved flight-worthy the boosters for the Apollo 11 mission -- the mission that landed the first men on the moon.

Space Shuttle Main Engine Testing

A new chapter was added in June 1975 when the Space Shuttle Main Engine was tested at SSC for the first time. All the engines used to boost the Space Shuttle into low-Earth orbit are flight certified at SSC on the same stands used to test fire all first and second stages of the Saturn V in the Apollo and Skylab programs. Space Shuttle Main Engine testing is expected to continue through the year 2001 and beyond, supporting the shuttle missions and the planned Space Station.

Capabilities

(The following information was taken verbatim from http://www.ssc.nasa.gov/propulsion/infrastructure/Default.htm. Follow the links Propellant Handling, High Pressure Gas Facility, and High Pressure Industrial Water on that page.)

Propellant Handling

- Large scale cryogenic propellant handling expertise
- Liquid Hydrogen (LH2): 12 M lbs/yr
- Liquid Oxygen (LOX): 3 M lbs/yr
- Fleet of 6 LOX and 3 LH2 barges
- 460,000 gal LOX and 600,000 gal LH2 storage spheres
- Barge docks with real-time transfer capability at each vertical test stand

High Pressure Gas Facility

- Receives, compresses, stores, and distributes gases required to support propulsion testing and other SSC-assigned missions.
- Gases distributed by the HPGF are Helium, Nitrogen, Hydrogen and Air.

High Pressure Industrial Water

- Ten Nordberg diesel engines pumping at a maximum rate of 330,000 GPM are used for fire protection and deluge in support of rocket engine testing at SSC.

- Four diesel 33 KVA electric generators are used to provide emergency electrical power.

Overview of SSC Test Sites

(This section is based on the "Propulsion Test Facilities" introduction section of the "SSC Test Facilities Capability Handbook", which may not be publicly available.)

SSC maintains full scale rocket engine/motor test facilities, component and small engine test facilities, and a materials test facility. A full scale solid rocket motor test facility is currently unfinished (but infrastructure is primarily complete).

The A Test Complex and the B Test Complex accommodate large test stands sufficient for full-scale, liquid propellant rocket engine and system testing. The Diagnostic Testbed Facility, a liquid and/or gas propellant-supplied test facility capable of performing small and subscale rocket engine/component testing, is located in one cell of the Component Test Facility (CTF). Recent construction includes an HP, cryogenic CTF; a full-scale, solid rocket motor test facility (H-1); and a materials testing High Heat Flux Facility (HHFF).

SSC maintains a number of facilities and provides specialized services required for the direct support and operation of test facilities. Included are a cryogenics dock and operations area, High Pressure Gas Facility, High Pressure Industrial Water facility, emergency power-generation facilities, and electrical distribution systems.

SSC Test Sites

(This section is partially based on publicly available information located at http://sscgemini.ssc.nasa.gov/vmis-cgi/image_list_generation.exe?SITE=SSC. The information was supplemented by more information from the "Test Facilities Capability Handbook". The idea of this section is give customers a good understanding of our test capabilities in case they want to do their own testing here.)

A Test Complex

Highlights

The A complex consists of two single-position, vertical-firing test stands designated A-1 and A-2. The A-1 stand is used for research and development, and the A-2 stand is used for high altitude testing.

The A-1 Test Stand will be used for testing of the much-anticipated X-33 engine, also known as the aerospike engine. The A-2 Test Stand, which can simulate altitudes of 54,000 to 70,000 feet, is used for testing the Space Shuttle Main Engine (SSME).

Detailed Description of A Test Stands

Maximum test article size:	33 ft in diameter
Maximum dynamic load:	1.1 M-lb vertical (up), 1.7 M-lb vertical (rebound), 0.7 M-lb horizontal
Cryogenic fluids:	Liquid Oxygen (LOX) and Liquid Hydrogen (LH2)
Gases:	Gaseous Hydrogen (GH2), Helium (Ghe), Nitrogen (GN2) and Air (HA)
Fire deluge capacity:	75,000 gal/min
Altitude Simulation (A-2):	54,000 to 70,000 ft
Height:	160 feet

Other Features:

- Hazardous gas and fire detection systems
- 200-ton main derrick-lifting crane (down rated to 37.5 tons) with a 5 ton jib
- LH2 and LOX barge docks, storage, and transfer systems
- Stand-alone utility electrical power available from industrial motor-generator sets
- An integral flame deflector cooled by the high-pressure industrial water system (HPIW) with over 220,000 gal/min of cooling water
- Personnel and freight elevators
- Load and work platforms

Data Acquisition and Test Control

A common Test Control Center (TCC) is provided with separate A-1 and A-2 control systems. Both stands also utilize the resources of the Data Acquisition Facility. The Test control center is equipped with a NOVA computer with facility control consoles. Closed-circuit television and graphic display instrumentation systems are installed.

B Test Complex

Highlights

The B complex is a dual engine stand that has been modified for single engine tests. Currently the B-1 test stand is used for testing the RS-68, and the B-2 test stand is not in use.

The massive B complex contains over 86,000 cubic yards of concrete and over 7,000 tons of steel (more than the Eiffel Tower or the Empire State Building). The NASA logo that appears at the top of the complex is one of the largest NASA logos ever produced.

Detailed Description of Test Stands

Maximum test article size:	33 ft in diameter
Maximum dynamic load:	11.0 M-lb vertical (up), 8.5 M-lb vertical (rebound), 6.0 M-lb horizontal
Cryogenic fluids:	Liquid Oxygen (LOX) and Liquid Hydrogen (LH2)
Gases:	Gaseous Hydrogen (GH2), Helium (GHe), Nitrogen (GN2) and Air (HA)
Fire deluge capacity:	123,000 gal/min
Height:	264 feet

Other Features:

- Hazardous gas and fire detection systems
- 200-ton main derrick-lifting crane (currently proof tested to 37.5 tons) with a 20-ton jib crane and a 175-ton auxiliary derrick, lifting crane (also proof tested to 37.5 tons)
- LH2 and LOX barge docks, storage, and transfer systems
- Stand-alone utility electrical power available from industrial motor-generator sets
- An integral flame deflector cooled by the high-pressure industrial water system (HPIW) with over 330,000 gal/min of cooling water
- Personnel and freight elevators
- Load and work platforms

Data Acquisition and Test Control

A common Test Control Center (TCC) is provided with separate B-1 and B-2 control systems. Both stands also utilize the resources of the Data Acquisition Facility. The Test control center is equipped with a NOVA computer with facility control consoles. Closed-circuit television and graphic display instrumentation systems are installed.

H Test Facility

Highlights

The H-1 test stand was designed to test the next generation solid rocket motors for the space shuttle ASRM. However, with the deletion of the ASRM program the test stand was not completed. Instead what was accomplished was the completion of the infrastructure which may readily conform to other large scale motor testing configurations. Test projects, including small rocket motors, have been tested at H-1, taking advantage of the existing infrastructure.

Detailed Description

Construction of the H-1 test stand is not complete. Some of the major attributes are as follows:

- Thrust abutment - Capable of supporting a test stand with the following characteristics:
    - Forward load of 4,130,000 lb Axial, 691,000 lb Vertical, and 9,450 lb Lateral
    - Aft thrust load of 899,000 lb Vertical and 426,000 lb Lateral
- Barge access - Fully completed barge dock
- Motor Conditioning Building - To provide temperature conditioning of motors. Also provides an enclosed shelter for test setup, assembly, and disassembly.
- A 330 ton rail mounted gantry crane capable of traversing the test stand and the Motor Conditioning Building. The crane has a 77 ft clear width and 45 ft hook height. A 30 ton auxiliary crane is also provided by the gantry crane.
- Support buildings - Signal Conditioning Building, Instrument/Utility Bunker, Equipment Storage Building, Test Control Center, Signal Conditioning Building, cable tunnels to the test stand.
- CO_2, GN_2, shop air, and water

Current Tests

Space Shuttle Main Engine

(This section is based on publicly available information located at http://www.ssc.nasa.gov/about/history/ and http://www.ssc.nasa.gov/~ssme/ssmeinfo.html)

When a NASA Space Shuttle lifts off the launch pad, it does so with the help of three reusable, high-performance rocket engines. These engines are called Space Shuttle Main Engines (SSMEs). The SSME is the most advanced liquid-fueled rocket engine ever built. Its main features are variable thrust, high performance, reusability, total redundancy, and a fully integrated controller. The performance of the engine is the highest thrust for its weight of any engine yet developed.

SSME testing began at the Stennis Space Center (SSC) in June 1975 and is expected to continue well into the 21st century. All the engines used to boost the Space Shuttle into low-Earth orbit are flight certified at SSC on the A and B test complexes.

RS-68

(This section is based on publicly available information located at http://www.praxair.com/Praxair.nsf/64385d83720ebcd3852568cb00725ef6/9a89907fa976f7338525664700544354?OpenDocument)

The RS-68 is a rocket engine developed by Boeing for their Delta IV Evolved Expendable Launch Vehicle (EELV), aimed at reducing space launch costs up to 50 percent. The RS-68 is a liquid hydrogen/liquid oxygen engine that develops 650,000 pounds of sea level thrust. It is 30 percent more efficient than conventional liquid oxygen/kerosene engines and it produces only water as a combustion by-product.

The RS-68 engines are being tested at Stennis Space Center and the Air Force Research Laboratory (AFRL) at Edwards AFB, California. The engine program is on track for first launch of the Delta IV in early 2002.

Hybrid Sounding Rocket

(This section is based on publicly available information located at http://www.lockheedmartin.com/michoud/news/1999news/june_8.htm)

The Hybrid Sounding Rocket (HYSR), produced by Lockheed Martin Michoud Operations in New Orleans, is designed for suborbital space and atmospheric science missions. The HYSR will also be used as a flyable testbed for small-scale experiments. This project is performed under a Space Act Agreement managed by Marshall Space Flight Center in Huntsville, Alabama.

A hybrid propulsion system consists of an inert, solid fuel grain and a separate oxidizer source. The hybrid sounding rocket will lower costs, provide safer operations and decrease the environmental impact of repeated flight operations.

The hybrid vehicle is designed to produce a sea level thrust in excess of 50,000 pounds (222 kN) and to lift a 1,200-pound (544 kg) payload to an altitude of greater than 175 miles (281 km).

The HYSR passed its first ground test at Stennis in February 2000.

Excalibur

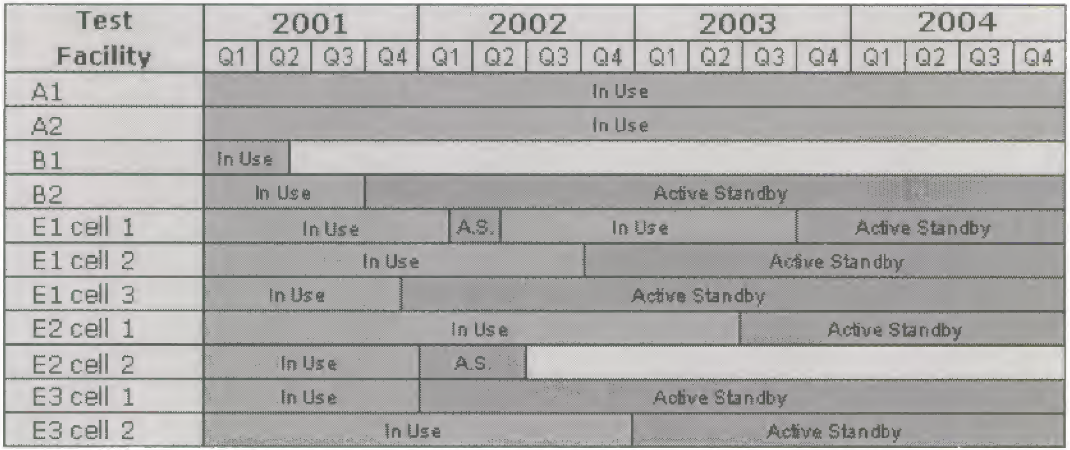
(This section is based on publicly available information available at http://www.rctruax.com/lcslv.html)

Excalibur launch vehicles are pressure-fed, recoverable stage launch vehicles, designed and manufactured by Truax Engineering, Inc. These are capable of placing payloads ranging from 500 to 1,000,000 lbs in orbit. The refurbishment costs of these vehicles are expected to fall in the range of 7% to 10% of acquisition costs.

Excalibur launch vehicles are tested at Stennis Space Center and other testing centers. For more information about these launch vehicles, visit Truax Engineering, Inc.

Testing Schedule

(This graphic contains less information than a similar (publicly available) one located at http://www.ssc.nasa.gov/propulsion/teststandu/Default.htm)



ipds

- Testing at SSC
- Current Tests
- Work With Us
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Work With Us

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Propulsion Testing Application Form

The following form is only for initial inquiries into propulsion testing. For other inquiries, email Freddie.Douglas@ssc.nasa.gov.

In accordance with NASA policies, we do not collect personal information from children. **Do not fill out this form if you are under the age of 18**. If you have questions about collection of personal information on NASA web sites, please read the NASA privacy policy.

Contact Information

Name:

Phone Number:

Email Address:

Fax Number:

Mailing Address:

Company or Organization Name:

Citizenship Information

Are you a U.S. citizen?
(If yes, skip to Project Information section) Yes No

If you are not a U.S. citizen, do you have a U.S. Lawful Permanent Residence (LPR) status?

Yes No

Immigrant Visa number, if relevant

Visa expiration date

Do you have a U.S. non-immigrant Visa status? Yes No

Visa category

If you are not a U.S. resident, please indicate all countries of citizenship

Project Information

Will the information you provide to us be any of the following? (Check all that apply)

- Proprietary
- Competition Sensitive
- Export Controlled

Where will funding for this project come from?

- Government
- Commercial
- Other, please explain

Check any of the following government programs this project is related to:

- NASA
- Department of Defense
- Other government agency, please name

Do you want to be present (i.e. at Stennis) for the test?

- Yes
- No

When do you need a response to this form?

General Testing Information

Test Type: engine

When would you like to begin testing?

When will the test article be available?

Anticipated number of tests

Expected duration of a single test (in seconds)

Test Article Description

Thrust:

Weight:

Height:

Width:

Depth:

Fuels and Oxidizers

		Flow		Pressure	
Fuels	LH2		lbs/sec		psig
	RP-1		lbs/sec		psig
Pressurant Gases	GHe		scfm		psig
	GN2		scfm		psig

Oxidizers	LOX	lbs/sec	psig

Data Requirements

Low Speed: channels

High Speed: channels

Format: Magnetic Tape Plots Photographs Video

Abort Monitor Requirements: No

Altitude Simulation: No - Sea Level

Pogo Pulse Measurement: No

Pogo Pulse Damping: No

Thrust Measurement Requirements: No

Other Requirements

Clean Room Requirements: No

Cooing/Deluge Water Requirements: No

Gimbaling Requirements: No

Special Safety Considerations: No

Remarks:

Summary

Test Summary and Objectives:

Submit Reset

Related Links:

- Testing your own propulsion article
- NASA Requests for Assistance
- Online tools

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